

IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, *et al.*, )

*Plaintiffs,* )

v. )

Case No. 4:05-cv-00329-GKF-PJC

TYSON FOODS, INC., *et al.*, )

*Defendants.* )

**DEFENDANTS' RESPONSE TO STATE OF OKLAHOMA'S MOTION IN LIMINE**  
**TO PRECLUDE EXPERT TESTIMONY OF DEFENDANTS'**  
**WITNESS GLENN JOHNSON, Ph.D.**

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Defendants respectfully submit this brief in opposition to Plaintiffs' motion to exclude the testimony of Dr. Glenn Johnson. *See* State of Oklahoma's Motion in Limine to Preclude Expert Testimony of Defendants' Witness Glenn Johnson, Ph.D., Dkt. No. 2083 (May 18, 2009). Dr. Johnson is one of the nation's leading experts on the use of multivariate statistical analysis such as principal component analysis ("PCA") to evaluate large environmental data sets. *See* Ex. 1, Johnson Rpt., Appendix B (curriculum vitae). He was asked by Defendants to review the incredible and novel claim that Plaintiffs' expert, Dr. Roger Olsen, had discovered in this litigation a new and "unique chemical signature for poultry litter" using a PCA.<sup>1</sup> Dr. Johnson found numerous problems with Dr. Olsen's PCA work, any one of which invalidates Dr. Olsen's claim that he has found a unique chemical signature for poultry litter in environmental samples collected throughout the Illinois River Watershed (the "IRW").<sup>2</sup> In their Motion, Plaintiffs

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<sup>1</sup> Dr. Johnson is a true rebuttal expert. His work and opinions in this case have been limited to the identification and evaluation of the numerous flaws and mistakes in Dr. Olsen's PCA-based "chemical signature" analysis which render that analysis unreliable and in fact meaningless. During the preliminary injunction hearing, the Court held that Dr. Olsen's "chemical signature" opinions were unreliable and insufficient to meet the *Daubert* criteria for admissibility of expert testimony. Opinion and Order, Dkt. No. 1765 at 6-7 (Sept. 25, 2008). That ruling was subsequently affirmed by the 10<sup>th</sup> Circuit Court of Appeals. *Attorney General of Oklahoma v. Tyson Foods, Inc.*, \_\_\_ F.3d \_\_\_, 2008 WL 1313216 (10th Cir. 2009). Defendants have filed a motion asking the Court to reaffirm its ruling with respect to Dr. Olsen for purposes of the upcoming trial. Defs. Mot. to Exclude Testimony of Dr. Roger Olsen, Dkt. No. 2082 (filed May 18, 2009). If the Court grants that motion, Defendants will not offer Dr. Johnson's testimony and Plaintiffs' motion as to his testimony will be moot.

<sup>2</sup> In an apparent attempt to conceal the thoroughness and breadth of Dr. Johnson's work in this case, Plaintiffs provided the Court with only 4 pages of Dr. Johnson's report. *See* Dkt. No. 2083, Pltfs. Mot., Ex. A. The entire 125 page report of Dr. Johnson is attached as Exhibit 1.

challenge one of Dr. Johnson's opinions.<sup>3</sup> Plaintiffs claim that Dr. Johnson should not be permitted to inform the jury that the variability in the statistical output of the PCA that Dr. Olsen subjectively interpreted as "source signatures" was the product of differences in the amount of particulate matter in various samples and not by different sources impacting the samples. As Dr. Johnson stated in his report, "what he [i.e., Dr. Olsen] discovered is nothing more profound than the distinction between muddy water and salty water." Ex. 1, Johnson Rpt., p. 68. As is shown hereinafter, Plaintiffs' attacks on this opinion, its foundation and Dr. Johnson's qualifications are baseless. Dr. Johnson fairly and accurately critiques Dr. Olsen's PCA work, and his testimony, including the one opinion challenged by Plaintiffs, readily satisfies the *Daubert* standards for admissibility. Consequently, Plaintiffs' motion should be denied.

### LEGAL STANDARD

Federal Rule of Evidence 702 permits "a witness qualified as an expert by knowledge, skill, experience, training, or education" to testify regarding "scientific, technical, or other

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<sup>3</sup> Dr. Johnson's six primary opinions are summarized on pages 4 and 5 of his report. *Id.*, pp. 4-5 ("[1] Olsen's PCA cannot differentiate between poultry and other sources in the IRW . . . . [2] Olsen made fundamental errors related to basic assumptions of the PCA method . . . . [3] Olsen made a number of errors in implementation of PCA . . . . [4] There are problems with the quality of this dataset, such that it is doubtful that a correctly implemented PCA would have yielded results that would allow differentiation of source fingerprints . . . . [5] Even if we ignore the problems of data quality, assumptions and implementation and accept Olsen's PCA results at face value, a detailed review of Olsen's interpretations reveals major contradictions . . . . and [6] Olsen fail[ed] to recognize influence of total concentration and geochemical partitioning on the PCA.") Plaintiffs do not challenge Dr. Johnson's first five primary opinions or his qualifications to review and critique the methods employed by Dr. Olsen in arriving at his "unique chemical signature for poultry litter" that is purportedly based upon PCA. Rather, Plaintiffs' challenge of Dr. Johnson relates very narrowly to his sixth opinion which they describe as "process based PCA opinion." Pltfs. Mot., pp. 1-3, 6-8. As the discussions that follow delve into the minutiae of Plaintiffs' specific allegations, the Court should not lose sight of the most important (and unchallenged) opinion in Dr. Johnson's report: Olsen's PCA cannot identify unique source patterns related to cattle waste, poultry litter, waste water treatment plants ("WWTP") effluent or other potential sources in the IRW.

specialized knowledge [that will] assist the trier of fact to understand the evidence or to determine a fact in issue” so long as “(1) the testimony is based on sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.” Fed. R. Evid. 702. Trial courts are charged with ensuring that expert testimony presented to the jury is both relevant and reliable. *Attorney General of Oklahoma v. Tyson Foods, Inc.*, \_\_\_ F.3d \_\_\_, 2008 WL 1313216, at \*6 (10th Cir. 2009); *Dodge v. Cotter*, 328 F.3d 1212, 1221 (10th Cir. 2003). The Court must first “determine if the expert’s proffered testimony has a reliable basis in the knowledge and experience of his or her discipline.” *Norris v. Baxter Healthcare Corp.*, 397 F.3d 878, 883-84 (10th Cir. 2005) (quotations, ellipses omitted). Then, the Court must determine whether the challenged experts’ reasoning and methodology is reliable. *Id.* at 884. If an expert’s testimony is grounded in the expert’s area of specialized knowledge, based on sound data and reliable methodology, and soundly applied to the facts of the case, the testimony should be admitted. *Id.*

## DISCUSSION

Dr. Johnson is highly qualified to testify as to the mistakes and flaws in Dr. Olsen’s PCA methodology for this case and to offer a scientific interpretation of the statistical results of the PCA as opposed to Dr. Olsen’s subjective claim that he “sees” a poultry litter signature in those results. Plaintiffs’ criticisms of Dr. Johnson’s analysis and proposed testimony flow from their misunderstanding or misrepresentation of his testimony and his qualifications. None of their criticisms are valid.

### **A. Plaintiffs Mischaracterize the Challenged Opinion**

In a classic straw man argument, Plaintiffs distort and exaggerate the opinions actually offered by Dr. Johnson in his report and then attack as unreliable the caricature they have

erected. Plaintiffs claim that Dr. Johnson has “conclude[d] that the IRW water quality problems are a result of natural processes” (Pltfs. Mot., p. 3) and then devote the balance of their motion to attacking this purported opinion. Plaintiffs and their experts claim that Dr. Johnson has no basis to offer this opinion because he “does not know whether the phosphorus levels in the IRW are natural or the result of man-made conditions . . . .” *Id.*, p. 3; *see also*, Pltfs. Mot., Ex. C, Loftis Decl. ¶ 20 (“he [Dr. Johnson] does not know whether the currently observed concentrations in the IRW represent naturally occurring conditions or instead represent elevated levels due to sources related to human activity such as the land application of poultry waste.”) Dr. Johnson has not offered these opinions. He has not opined that the concentrations of phosphorus in the IRW are the product of natural conditions. Ex. 2, Johnson Decl., ¶ 6.<sup>4</sup>

Dr. Johnson’s sixth primary opinion regarding the “geochemical processes” that actually control the PCA results that Dr. Olsen subjectively and improperly interprets as a “poultry litter” signature does not purport to establish anything with respect to naturally occurring levels of phosphorus or any other constituent of concern. The opinion, which Plaintiffs mischaracterize for purpose of challenging but refuse to actually quote in their motion states:

**Failure to Recognize Influence of Total Concentration and Geochemical Partitioning on the PCA.** By assuming from the outset that source signatures control this data set, Olsen completely missed the two primary controls on the surface water and groundwater data sets: (1) total concentration; and (2) how chemicals redistribute in the environment according to their affinity for the dissolved phase versus association with suspended particulate matter. Olsen’s PCA cannot be used to infer any source of contamination to the IRW, let alone poultry.

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<sup>4</sup> The submission of an expert declaration from Dr. Johnson was necessitated by Plaintiffs’ improper submission of an expert declaration from Dr. Olsen containing new analysis and the declaration of Dr. Loftis, an expert for which Plaintiffs have made no Rule 26 disclosures.

Ex. 1, Johnson Rpt., p. 5. In the portions of his report that Plaintiffs did not attach, Dr. Johnson provides a detailed explanation of this opinion, describes the analysis he conducted to support this opinion and explains a series of tests he conducted on the environmental sampling data used by Dr. Olsen in the PCA to validate the opinion that the PC1 and PC2 scores from the PCA were the result not of different sources impacting different samples, but rather the degree to which a water sample has high concentrations of suspended sediment (i.e., particulate-bound constituents) or dissolved constituents. *Id.*, pp. 60-68.

Contrary to Plaintiffs' claims in their Motion, Dr. Johnson has not offered the opinion as to the source of phosphorus (natural versus man-made condition) in a particular environmental sample collected by Dr. Olsen and included in his PCA. *See generally* Ex. 1, Johnson Rpt.; *see also* Ex. 2, Johnson Decl. ¶ 6. Such an opinion would be inconsistent with the finding by Dr. Johnson that the "patterns" that Dr. Olsen interprets as a chemical signature for poultry litter are not related to the original source of constituents found in the water samples because the constituents at issue are not conservative once introduced into the environment. In his report, Dr. Johnson cogently explains the impact of Dr. Olsen's decision to ignore the obvious results of the basic geochemical process that everyone agrees is ongoing in the IRW as follows:

Olsen's PCA applied to this data set did not resolve sources because these chemicals are not conservative in the environment. That is, they do not behave similarly in an aqueous environment. Diagnostic chemical differences and ratios that might be observed in the original presumed source materials (i.e., poultry litter, cattle manure, WWTP effluent) are not preserved once those constituents are in water. Olsen's analysis was doomed from the start because he assumed a geochemical system controlled by unchanging ratios of source-diagnostic chemicals/bacteria. As is discussed in Section 4.0 [i.e., the section explaining the challenged sixth primary opinion], the actual controls on this system are the degrees to which a few key chemicals (in particular total sodium, chloride, total iron and total aluminum) have a preferential affinity for dissolved phase, or tend to be associated with suspended particulate matter. Olsen has not discovered unique chemical/biological signatures related to poultry and WWTP effluent.



Rather, his PCA does nothing more than distinguish between turbid water and salty water.

Ex. 1, Johnson Rpt., p. 70.<sup>5</sup> Dr. Johnson's opinion is not that he has found a signature for "natural conditions" as opposed to land applied poultry litter. Dr. Johnson's opinion is that the PCA put forward by Dr. Olsen tells us more about what happens to the constituents evaluated by Dr. Olsen *after* they enter the water from whatever source. Ex. 2, Johnson Decl. ¶ 6. Some constituents (like aluminum and iron) are found primarily in particulate matter and are therefore found in higher concentrations in samples of turbid water, while other constituents (like sodium and chloride) dissolve more easily and are therefore found in higher concentrations in samples with more dissolved than particulate constituents. Ex. 2, Johnson Decl. ¶¶ 6, 8, 9. This is Dr. Johnson's sixth primary opinion about "geochemical processes" as opposed to sources driving the variability in Olsen's PCA. The substance of this opinion is not challenged by Plaintiffs in their motion or by Plaintiffs' experts (Dr. Olsen and Dr. Loftis) in their declarations.

Rather than take on Dr. Johnson's "geochemical process" opinion directly, Plaintiffs dwell in their motion on a relatively minor point made by Dr. Johnson regarding the extent to which phosphorus tends to be found in water in either a particulate-bound or dissolved phase. Once again, Plaintiffs misrepresent Dr. Johnson's actual position. Plaintiffs claim that Dr. Johnson has opined that "most of the phosphorus in the IRW is particulate in nature." Pltfs. Mot., p. 6; *see also, Id.*, pp. 3, 4, 6-7. Dr. Johnson has not offered any quantitative opinion as to

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<sup>5</sup> This opinion is consistent with findings Dr. Johnson has expressed in a published environmental treatise. Ex. 2, Johnson Decl., ¶ 8 *quoting* Johnson 2007, Principal Components analysis and receptor models in environmental forensics, An Introduction to Environmental Forensics ("the end-members [i.e., PCs] are not sources of groundwater but rather related to geochemical processes that alter the chemical composition of groundwater" and "[E]nvironmental processes have the potential to confound receptor model results . . . Given a situation of multiple sources, and patterns modified by one or more alteration processes, source apportionment is more difficult.")

what percentage of phosphorus in the IRW is found in either a dissolved or a particulate-bound phase. Ex. 2, Johnson Decl. ¶ 6.

With respect to the phase of phosphorus, Dr. Johnson has simply made four observations, none of which has been challenged by Plaintiffs or their experts. First, he explained that samples with “high” PC1 scores in Olsen’s PCA tend to show increasing trends in particulate-bound phosphorus and total suspended solids. Ex. 1, Johnson Rpt., pp. 62-65. Second, he explained that samples with “high” PC2 scores in Olsen’s PCA tend to show increasing trends in dissolved phosphorus along with other readily dissolved constituents such as sodium and chloride. Ex. 1, Johnson Rpt., pp. 66-68. Third, he pointed out that sorption of phosphorus, iron and aluminum to sediment or soil particles is a well-known and common geochemical process. Ex. 1, Johnson Rpt., p. 62 (citing Stumm W., and J.J. Morgan, *Aquatic Chemistry*. Wiley. New York. 583 pp. (1<sup>st</sup> Ed – 3<sup>rd</sup>. Ed. 1996)). And, fourth, he referenced a peer-reviewed publication by another defense expert, Dr. Timothy Sullivan, for the again unchallenged finding that “total phosphorus in natural waters has been observed to correlate with total suspended solids.” Ex. 1, Johnson Rpt., p. 62 (*citing* Sullivan, et al., 2005). Plaintiffs’ attempt to turn these statements into something they are not should be rejected by the Court. As is shown hereinafter, Dr. Johnson’s actual opinions, including the limited observations he has made regarding the phases of phosphorus both in the IRW environment and within Dr. Olsen’s PCA dataset, are well founded and he is qualified to offer expert testimony on these subjects.

#### **B. Dr. Johnson Is Highly Qualified To Proffer the Testimony He Proposes**

Plaintiffs’ suggestion that Dr. Johnson lacks the requisite experience or expertise to offer the testimony outlined in his report including the challenged sixth primary opinion is completely baseless. Unlike Dr. Olsen, Dr. Johnson is a PCA expert with considerable experience in the

use of PCA to evaluate environmental datasets. Ex. 1, Johnson Rpt., Appendix B (curriculum vitae). He has authored six book chapters in treatises used to teach scientists how to properly use PCA and has published over 14 peer-reviewed journal articles relating to PCA and other similar statistical tools sometimes used to evaluate environmental datasets. Ex. 2, Johnson Decl., ¶ 2.

While Dr. Johnson has focused much of his professional career on multivariate statistics (and in particular PCA), he also has considerable education and experience in geochemical processes and the fate and transport of inorganic chemicals in water. He holds degrees in geology from East Carolina University, the University of Delaware and the University of South Carolina. Ex. 1, Johnson Rpt., Appendix B (curriculum vitae). His Ph.D. dissertation included two case studies applying PCA-based methods to inorganic chemicals in water. In both case studies, he found that the predominant control on variability observed within the environmental dataset was geochemical processes rather than anthropogenic sources. Ex. 2, Johnson Decl., ¶ 8. Dr. Johnson has published numerous papers and book chapters containing opinions about the impact of geochemical processes on the variability shown in results of multivariate statistical analysis of environmental datasets. Ex. 2, Johnson Decl., ¶ 8 (identifying and discussing relevant publications). Dr. Johnson has evaluated variability and patterns related to many different types of constituents in a multitude of different environmental media using PCA and other similar statistical tools. *Id.* ¶ 2. In his work, Dr. Johnson has evaluated environmental datasets that include inorganic elements such as iron, aluminum, sodium and chloride as well as synthetic materials such as PCBs. *Id.* He has worked with environmental datasets that include soil samples, air samples, groundwater samples, surface water samples, sediment samples and suspended sediment samples in surface water. *Id.* Dr. Johnson's experience with multivariate statistical analysis of environmental sampling data is broad. The fact that Dr. Johnson has not

devoted his professional career exclusively to the study of phosphorus is immaterial to his qualifications to testify about the flaws, errors and mistaken assumptions made by Dr. Olsen in his PCA work in this case.

Furthermore, Dr. Johnson's limited statements about the dissolved versus particulate-bound phases of phosphorus in the environment are supported by other defense experts and undisputed authoritative sources. Experts are, of course, entitled to rely upon other experts and authoritative sources to provide support on matters related to the opinions they are offering.<sup>6</sup> This is precisely what Dr. Johnson has done in this case with respect to the issues that Plaintiffs focus upon in their motion. Dr. Johnson relied upon a well recognized environmental treatise for his discussion of the commonly recognized sorption and adsorption processes that phosphorus undergoes in the environment. Ex. 1, Johnson Rpt., p. 62 (citing Stumm W., and J.J. Morgan, *Aquatic Chemistry*. Wiley. New York. 583 pp. (1<sup>st</sup> Ed – 3<sup>rd</sup> Ed. 1996)). And, he relied upon two other defense experts with more extensive background in nutrients, Dr. Timothy Sullivan and Dr. John Connolly, for his observation that total phosphorus in natural waters generally and in environmental samples from the IRW specifically, are commonly correlated

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<sup>6</sup> It is perfectly acceptable for an expert to rely upon work done by others. *See* Fed. R. Evid. 703 ("The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to the expert at or before the hearing. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence in order for the opinion or inference to be admitted."). It is not necessary that the expert have personal knowledge or expertise regarding the facts underlying his opinions. *See* Advisory Committee Note to Fed. R. Evid. 703 ("[t]he third source contemplated by the rule consists of presentation of data to the expert . . . other than by his own perception. . . . this rule brings the judicial practice into line with the practice of the experts themselves when not in court. . . . [For example] a physician in his day-to-day practice relies upon the opinions of nurses, technicians, and other doctors. He should be able to do the same in court, and "his validation, expertly performed and subject to cross-examination, ought to suffice for judicial purposes." (citing Rheingold, *The Basis of Medical Testimony*, 15 Vand. L. Rev. 473, n. 9 (1962)).

with the total suspended sediments (i.e., particulate matter) and iron and aluminum. Ex. 2, Johnson Decl., ¶ 8. Dr. Johnson's reliance upon these sources is entirely proper.

Finally and importantly, Dr. Johnson's analysis of the PCA work put forward by Dr. Olsen does not hinge upon the specifics of the chemical processes whereby phosphorus either adsorbs to particles or dissolves in water. Dr. Johnson's criticism is that Dr. Olsen ignored the impact of known geochemical processes such as partitioning, sorption and adsorption of various constituents that comprise his supposed "source signatures." Plaintiffs are critical of Dr. Johnson because he has not, in their view, quantified the relative amounts of dissolved versus particulate-bound phosphorus in the IRW or evaluated all the various chemical processes that can cause sorption or adsorption of phosphorus in the IRW (i.e., pH levels, the surface charge of suspended particles at various pH levels or the partition coefficient for phosphorus), but none of this is relevant to the opinion at issue. No one denies that partitioning of constituents, including phosphorus, occurs in the IRW.<sup>7</sup> Dr. Johnson's role in this case is not to explain the chemistry of how those processes occur, but rather to explain the impact of these known processes on the PCA results from which Dr. Olsen mistakenly derives purported "source fingerprints." Dr. Johnson's credentials in the area of multivariate statistical analysis such as PCA cannot be seriously questioned. He is imminently qualified to assist the jury in understanding what the PC scores that Dr. Olsen interprets as source fingerprints actually mean and the impact of Dr. Olsen's failure to consider in his analysis the impact of natural geochemical changes in the substances that comprise his supposed fingerprints.

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<sup>7</sup> While Plaintiffs' experts, Olsen and Loftis, have submitted declarations arguing that Dr. Johnson has not adequately investigated or explained how phosphorus absorbs or desorbs in water in the IRW, neither of these experts challenge the fact that these processes occur in the IRW and were ignored by Dr. Olsen in his PCA work. *See generally*, Pltfs. Mot., Ex. C (Loftis Decl.) and Ex. D (Olsen Decl.).

### **C. Dr. Johnson's Testimony is Based upon an Adequate Factual Foundation**

Plaintiffs claim that Dr. Johnson lacks an adequate scientific basis to support his sixth primary opinion regarding the processes actually responsible for the variability in the PCA dataset that Dr. Olsen assumed to relate to sources is completely without merit. The opinions of Dr. Johnson, including the challenged sixth primary opinion, are well supported by scientific data and detailed investigation and analysis.

First, Plaintiffs falsely claim that Dr. Johnson “did no analysis of potential sources and that his failure to do so demonstrates that his conclusion lacks a factual foundation.” Pltfs. Mot., p. 2. To support this claim, Plaintiffs selectively quote portions of Dr. Johnson’s deposition where he simply agreed that he was not the defense expert responsible for investigating and quantifying the major sources of phosphorus in the IRW. Pltfs. Mot. p. 2 and Ex. D (Olsen Decl.), ¶¶ 7-8. To suggest, as Plaintiffs do, that this testimony confirms that Dr. Johnson “did no analysis of potential sources” is disingenuous. As Plaintiffs know, Dr. Johnson reviewed the exact same information on “other sources” (i.e., other than poultry litter) that Dr. Olsen considered in his own PCA. Dr. Johnson’s report is replete with references to his evaluation of information about other potential sources and discussion of how the available information about other potential sources actually contradicts the conclusions reached by Dr. Olsen. Ex. 2, Johnson Decl., ¶ 7 (referencing evaluation of information on potential sources such as cattle, wastewater treatment plants, urban land use areas and poultry). Furthermore, Dr. Johnson conducted a thorough tour of the IRW in July 2008. *Id.* ¶ 7. He not only took an aerial tour of the IRW, but he also took a driving tour of the watershed. *Id.* During his tour of the IRW, Dr. Johnson observed the various urban, industrial and agricultural land uses throughout the IRW that can contribute phosphorus to surface waters and groundwater as well as the location of WWTPs that



discharge phosphorus daily into the IRW streams and rivers. *Id.* Finally, as explained by Dr. Johnson in his deposition, he worked closely with other defense experts who were charged specifically with identifying and characterizing other source of phosphorus in the IRW. Ex. 3, Johnson Dep., pp. 499-500 (identifying Dr. Tim Sullivan and Dr. John Connolly as defense experts who were involved in source identification and characterization). These other experts reviewed Dr. Johnson's report before it was issued and agreed with his findings. *Id.*, pp. 500-01. Simply put, Dr. Johnson evaluated sources of phosphorus in the IRW as part of his review of Dr. Olsen's PCA to the same, if not a greater, extent than Dr. Olsen considered such information. To suggest that Dr. Johnson evaluated the PCA without any appreciation for the various sources of phosphorus that can impact water quality in the IRW is simply not true.

Second, Plaintiff' claim that Dr. Johnson's sixth primary opinion is unfounded because that opinion, according to Plaintiffs, "relies on his premise that most of the phosphorus in the IRW is particulate bound." Pltfs. Mot., p. 6. Once again, Plaintiffs are misrepresenting or at least exaggerating Dr. Johnson's opinions. Dr. Johnson has not offered any sweeping opinion as to the relative proportion of phosphorus across the entire universe of IRW samples that is in particulate-bound as opposed to dissolved phase. Ex. 2, Johnson Decl. ¶ 6. Dr. Johnson's work has focused on the much smaller subset of sampling data that Dr. Olsen chose to include in his PCA. With respect to surface water samples, this smaller universe is only 573 of the 2,325 samples collected by Dr. Olsen. Ex. 1, Johnson Rpt., p. 12 (Table 2-1). Within this dataset, Dr. Johnson evaluated the amount of reported total phosphorus and dissolved phosphorus (along with reported amounts of iron, aluminum, chloride and sodium) to determine whether changes in the concentrations of dissolved versus particulate-bound constituents corresponded with the changes in the PC1 and PC2 scores that Dr. Olsen interprets as source signatures. Ex. 1, Johnson

Rpt, pp. 60-68. As Dr. Johnson explained in his report, this analysis confirmed that what was driving the variability *within the dataset that Dr. Olsen used in his PCA*, is “solution/adsorption processes, not sources.” Ex. 1, Johnson Rpt., p. 66. With respect to solution/adsorption of phosphorus within the small subset of samples included by Dr. Olsen in his PCA, Dr. Johnson’s analysis empirically proved what he said in his report and in his deposition – that samples with higher PC2 scores tend to have more dissolved phase phosphorus whereas samples with higher PC1 scores tend to have more particulate-bound phosphorus. Ex. 1, Johnson Decl., ¶ 9. The fact that averages of results for Plaintiffs’ broader set of environmental sampling data show more dissolved phase phosphorus than particulate-bound phosphorus is of no consequence to Dr. Johnson’s analysis. *Id.* The point of his analysis was to show that changes in dissolved phase versus particulate-bound phase constituents (including, but not limited, to phosphorus) completely unrelated to the original source or form of the phosphorus dictates the PC1 and PC2 scores that Dr. Olsen improperly interprets as sources. *Id.* Plaintiffs’ claims with regard to the IRW as a whole or a broader set of data than what was used by Dr. Olsen in his PCA in no way contradicts or undercuts Dr. Johnson’s opinion that Dr. Olsen’s “chemical signature” simply shows the differences between muddy water and salty water. *Id.*

Plaintiffs’ claims that Dr. Johnson’s sixth primary opinion lacks a foundation in scientific data or relies upon a false premise are completely without merit. Dr. Johnson has conducted a thorough review of the data used by Dr. Olsen in his PCA and the results of the PCA analysis; something that Dr. Olsen failed to do. Dr. Johnson’s opinion regarding the impact of the dissolved versus particulate-bound constituents, including phosphorus, on the results of the PCA is based upon an extensive review of the sampling data used by Dr. Olsen in his PCA. The opinion challenged is both well-founded and reliable.



**CONCLUSION**

For the foregoing reasons, the Court should deny the State of Oklahoma's Motion in Limine to Preclude Expert Testimony of Defendants' Witness Glenn Johnson, Ph.D.

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